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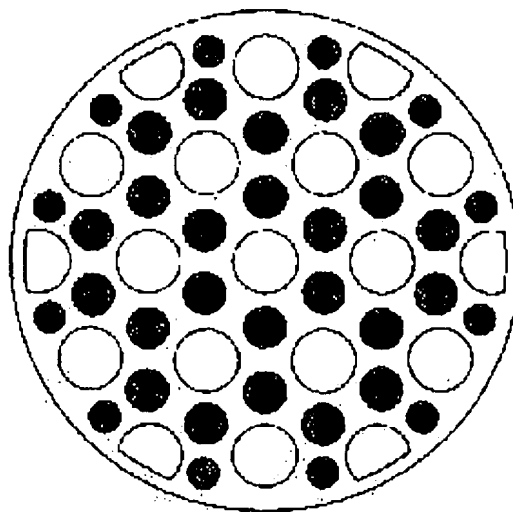
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## (54) FILTER ELEMENT AND ITS PRODUCTION PROCESS

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a filter element of which the cross-sectional area of each of an inlet side fluid passage and an outlet side fluid passage is adjusted to an optimum area corresponding to the liquid to be filtered, and also to provide a production process by which this filter element can be produced with a simple sealing stage.

**SOLUTION:** This filter element comprises a filter base material provided with a fluid passage group consisting of many fluid passages which are parallel to each other and separated from each other by a porous wall, wherein: the fluid passage group consists of large-diameter fluid passages each having a large cross-sectional area and small-diameter fluid passages having one or plural kinds of smaller cross-sectional areas than those of the large-diameter fluid passages; and one end face of each of the large-diameter fluid passages and one end face of each of the small-diameter fluid passages having one or several kinds of cross-sectional areas are sealed so that the sealed end face of each of the large-diameter fluid passages and the sealed end face of each of the small-diameter fluid passages are opposite to each other. This production process of the filter element comprises only a stage for immersing the filter



base material in a sealant.

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CLAIMS

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[Claim(s)]

[Claim 1] In the filter base material of a large number divided with the porous wall which consists of an parallel fluid channel mutually While a cross section consists of a large large diameter fluid channel and a narrow diameter fluid channel which has the magnitude of at least one cross section smaller than a large diameter fluid channel and a fluid channel carries out eye closure of one end face of a large diameter fluid channel The filter element characterized by a large diameter fluid channel carrying out eye closure of the narrow diameter fluid channel which has the magnitude of at least one cross section by the end face of the opposite side with the end face by which the eye closure was carried out.

[Claim 2] The filter element according to claim 1 to which the cross section of said fluid channel arranged the narrow diameter fluid channel in the surroundings of a large diameter fluid channel on the basis of the round shape.

[Claim 3] The filter element according to claim 1 to which the cross section of said fluid channel arranged the narrow diameter fluid channel in the surroundings of a large diameter fluid channel on the basis of the polygon.

[Claim 4] The filter element according to claim 3 said whose polygon is a hexagon-like.

[Claim 5] A filter element given in any 1 term of claims 1-4 which the gross area of said narrow diameter fluid channel exceeds 40% of the gross area of said large diameter fluid channel in a vertical cross section on the shaft of a filter element, and are 120% or less.

[Claim 6] A filter element given in any 1 term of claims 1-5 which used said large diameter fluid channel as the inlet port of a filtration fluid, and made said narrow diameter fluid channel the outlet of a founding fluid.

[Claim 7] A filter element given in any 1 term of claims 1-6 by which a filter element is used for filtration of the particle in filtration of the solution in filtration of a home water purifier, filtration of the polish liquid used with semiconductor fabrication machines and equipment, filtration of a circulation bath, and hydroponics, and a diesel particle stripper (DPF).

[Claim 8] A large diameter fluid channel with a consist of an parallel fluid channel mutually [ a large number divided with the porous wall ], and large fluid channel cross section, The preparation process for which the filter base material which consists of a narrow diameter fluid channel which has the magnitude of at least one cross section smaller than a large diameter fluid channel is prepared, The end side of the filter base material prepared at the preparation process is immersed in an eye sealing agent, and a large diameter fluid channel and a narrow diameter fluid channel are filled up with an eye sealing agent. An eye sealing agent is alternatively filled up into a narrow diameter fluid channel with discharging an eye sealing agent from the large diameter fluid channel of filter base material. After being filled up with an eye sealing agent so that it may be again immersed in an eye sealing agent and may become longer than the restoration die length of the eye sealing agent of a narrow diameter fluid channel about the restoration die length of the eye sealing agent of a large diameter fluid channel, filter base material is cut in the location which leaves only the eye sealing agent of a large diameter fluid channel. The first eye closure process which makes only a large diameter fluid channel fill up with an

eye sealing agent alternatively, The end face which carried out eye closure at the first eye closure process, and the end face of the opposite side are immersed in an eye sealing agent. After forming the restoration die length of the eye sealing agent of a narrow diameter fluid channel for a long time than the restoration die length of the eye sealing agent of a large diameter fluid channel, filter base material is cut in the location which leaves only the eye sealing agent of a narrow diameter fluid channel. the second eye closure process which makes only a narrow diameter fluid channel fill up with an eye sealing agent alternatively -- since -- the manufacture approach of the filter element characterized by becoming.

[Claim 9] A large diameter fluid channel with a consist of an parallel fluid channel mutually [ a large number divided with the porous wall ], and large fluid channel cross section, The preparation process for which the filter base material which consists of a narrow diameter fluid channel which has the magnitude of at least one cross section smaller than a large diameter fluid channel is prepared, By the end side of the filter base material prepared at the preparation process being immersed in an eye sealing agent, filling up a large diameter fluid channel and a narrow diameter fluid channel with eye encapsulant, and discharging an eye sealing agent from the large diameter fluid channel of filter base material The first eye closure process which makes only a narrow diameter fluid channel fill up with an eye sealing agent alternatively, The end face which carried out eye closure at the first eye closure process, and the end face of the opposite side are immersed in an eye sealing agent. After forming the restoration die length of the eye sealing agent of a large diameter fluid channel for a long time than the restoration die length of the eye sealing agent of a narrow diameter fluid channel, filter base material is cut in the location which leaves only the eye sealing agent of a large diameter fluid channel. the second eye closure process which makes only a large diameter fluid channel fill up with an eye sealing agent alternatively -- since -- the manufacture approach of the filter element characterized by becoming.

[Claim 10] The manufacture approach of a filter element according to claim 8 or 9 that said filter base material consists of a ceramic ingredient.

[Claim 11] The manufacture approach of a filter element according to claim 10 that filter base material performs said first eye closure process and the second eye closure process in the state of un-calcinating by said eye sealing agent consisting of a ceramic ingredient.

[Claim 12] The manufacture approach of a filter element according to claim 10 of said eye sealing agent being a ceramic ingredient or organic system adhesives, and performing said first eye closure process and the second eye closure process after calcinating filter base material.

[Claim 13] The manufacture approach of the filter element according to claim 8 or 9 which fills up a large diameter fluid channel and a narrow diameter fluid channel with an eye sealing agent by pulling up filter base material up in said first eye closure process after filter base material is immersed in an eye sealing agent.

[Claim 14] The manufacture approach of the filter element according to claim 8 or 9 alternatively filled up with an eye sealing agent so that the restoration die length of the eye sealing agent of a large diameter fluid channel or a narrow diameter fluid channel may become longer than the die length of the eye sealing agent of a narrow diameter fluid channel or a large diameter fluid channel in said second eye closure process by carrying out vacuum suction from the upper part of filter base material.

[Claim 15] The manufacture approach of the filter element according to claim 8 or 9 alternatively filled up with an eye sealing agent in said second eye closure process so that the restoration die length of the eye sealing agent of a large diameter fluid channel or a narrow diameter fluid channel may become longer than the die length of the eye sealing agent of a narrow diameter fluid channel or a large diameter fluid channel by moving filter base material caudad in an eye sealing agent after filter base material is immersed in an eye sealing agent.

[Claim 16] The manufacture approach of a filter element according to claim 8 or 9 of the both ends which carried out the eye closure of a filter element that the cover coat is applied to the whole surface at least.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the filter element used for filtration of the particle in filtration of the solution in filtration of a home water purifier, filtration of the polish liquid used with semiconductor fabrication machines and equipment, filtration of a circulation bath, and hydroponics, and a diesel particle stripper (DPF) etc., and its manufacture approach.

[0002]

[Description of the Prior Art] Filtration of the former to a home water purifier, filtration of the polish liquid used with semiconductor fabrication machines and equipment, As a filter element used for filtration of the particle in filtration of the solution in filtration of a circulation bath, and hydroponics, and a diesel particle stripper (DPF) etc. The filter element which carried out eye closure of the inlet-port section and the outlet section of a fluid channel which the filter equipments of a large number divided with the porous wall which consist of parallel fluid passage mutually adjoin by turns, and made the wall of a fluid channel the filtration side is known. Drawing 5 is drawing showing the end-face configuration of an example of the conventional filter element, and the eye closure of the part smeared away black is carried out, and it is used for filtration of a gas or a liquid.

[0003] Since the process of filter base material needs the fluid channel which a large number penetrated for the shaft orientations of filter base material, it is begun to carry out screw die pressing, and the opportunity and the approach of having begun to carry out cylinder die pressing and having used the opportunity which extrudes are adopted widely. As a cross-section configuration of a fluid channel, it crosses to all the cross sections of filter base material, and the fluid channel of the same dimension as the same cross-section configuration is formed fundamentally, therefore, also in the entrance side of a filtration fluid, the outlet side of a founding fluid also serves as the same fluid channel from the ease of manufacture of the extrusion metal mold which a rectangle, circular, a hexagon, etc. are adopted and can form this fluid channel.

[0004] Moreover, after the eye closure approach sticks on filter base material the mask pattern suitably chosen from rubber, the resin film, a metal membrane, etc. corresponding to the quality of the material of filter base material in the configuration shown in drawing 6 corresponding to the filter element shown in drawing 5 or puts it on the end face of filter base material, it is pouring in the eye sealing agent. The eye sealing agent which impregnation of this eye sealing agent was immersed in the filter base material which stuck the mask pattern shown in the slurry liquid which consists of the same ingredient for example, as filter base material at drawing 6 , or was prepared in the shape of clay since the drying shrinkage of the slurry whose path of a fluid channel is an eye sealing agent in an adult case was size was pressed fit by spatula-like a tool or a squeegee etc. Moreover, carried out the image processing of the hole array of the edge of filter base material optically, without using a mask pattern, the nozzle which can carry out quantum impregnation of the eye sealing agent was made to correspond to the fluid channel in which filter base material carries out eye closure, and the method of pouring a slurry into an eye closure part separately was also adopted.

[0005]

[Problem(s) to be Solved by the Invention] When the solid content in a gas or a liquid is filtered in the configuration and the eye closure approach of filter base material which were mentioned above, The fluid channel of filter base material by eye closure actuation bordering on the wall surface which is a filtration side The upstream, The downstream \*\*\*\* and it becomes owner bottom-like, respectively, and it deposits on the fluid channel of the upstream, and the solid content in the fluid which should be filtered is performing the sink and the so-called back wash for the fluid normaler than the fluid channel of the downstream to the upstream, if the resistance of a fluid which passes a wall surface becomes beyond a predetermined value. Although the filtration area of the upstream can make [ many ] reduction of filtration resistance, and alimentation of a solid as for the larger one since the life of the filter element as a filtration element is determined when the solid which invaded into the open pore of filter base material serves as removal impossible beyond a limit also in said back wash if the bore (d) of a fluid channel is made small in order to secure a filtration area -- a ratio with the shaft-orientations die length (L) of a fluid channel --  $L/d$  -- a large next door -- Since removing becomes impossible and the life of a filter becomes short even if the solid of the fluid channel of the shape of an owner bottom of the upstream deposited especially on the bottom part uses a back wash, it is supposed that  $L/d$  is [ 50 or less ] good. Moreover, if the path of a fluid channel is enlarged in order to make removal of a solid easy, although discharge of a solid becomes easy, the filtration area per filter element will decrease and the magnitude as a filter will serve as size.

[0006] Since the filter element used for filtration of the particle in filtration of the solution in filtration of a water purifier for home use, filtration of the polish liquid built in the CMP grinder in semi-conductor wafer manufacture, filtration of a circulation bath, and hydroponics and a diesel particle stripper (DPF) etc. makes equipment cheap, when it becomes impossible to secure predetermined fluid throughput from two months after one year, they may be exchanged without carrying out a back wash. The life as a filter element in this case is determined by the total surface area and the whole product of a fluid channel of the upstream. Since only the filtered pure fluid and 5 - 10% of detailed solid of the maximum pore diameter of a filter element penetrate to the downstream in any case, the downstream does not need the passage area of a fluid like the upstream, but since the upstream and the downstream of the fluid channel of the conventional filter element are the same cross sections, only in the part with the cross section of the fluid channel of the downstream superfluous [ the path of a filter element ], the dimension serves as size. Moreover, in order that the filter element of a disposable mold may secure a good filtration property by exchange of a short-term filter element like the above, it is needed that it is a low price.

[0007] The array and configurations of a fluid channel, such as a rectangle, circular, and a hexagon, are not fixed, either, and when sticking a mask pattern, after sticking a mask pattern, it is necessary to correct the gap with a mask pattern and the fluid channel of filter base material, since it can twist to filter base material at the time of shaping and deformation of deflection etc. occurs. Moreover, since the wall thickness which corresponded when said fluid channel became small, and has separated the fluid channel also decreases, the dimension of the bond part of the apertures of a mask pattern must also be made below into the wall thickness between said fluid channels, and a mask pattern is damaged, when the reinforcement of the mask pattern itself also falls and it sticks it. Moreover, after the fine grain of the front face of the filter base material itself tended to exfoliate and especially the method of sticking a mask pattern on the non-calcinated filter base material made from the ceramics performed sealing for the filter end face beforehand, it needed to paste up the mask pattern. Therefore, the eye closure method for having used the mask pattern was difficult for the filter base material formed in the fluid channel not more than  $\phi 2\text{mm}$  with the inscribed circle diameter.

[0008] In order to seal the deficit part which became size from the pore diameter of filter base material in the filtration wall surface and to recover pore distribution of the filter base material itself at an extrusion process, or in order to obtain a filtration pore diameter smaller than the pore diameter of filter base material, carrying out the coat of the upstream of the wall surface of filter base material with the ingredient of a pore diameter smaller than filter base material, and making it double layer structure is adopted widely. When in the case of the filter element of this structure placing a mask pattern and

pressing an eye sealing agent fit, the boundary section (\* mark part in drawing 7) of an eye sealing agent and filter base material becomes acute angle-like like drawing 7 in the configuration of the eye sealing agent in the edge of filter base material, exfoliation of said coat layer occurs, and it becomes impossible to demonstrate the function of a coat layer. Moreover, by this approach, control of the press fit depth of an eye sealing agent is difficult, and it is easy to generate a clearance in exfoliation of an eye sealing agent or the boundary section.

[0009] Since said inner acute-angle section does not occur to the eye closure method by press fit of an eye sealing agent and the approach immersed in an eye sealing agent presents a meniscus configuration with the smooth boundary section, it is the eye closure approach especially advantageous in the case of the filter structure made into said double layer structure, and desirable, but when the bore of a fluid channel is small, adhesion of a mask pattern and filter base material becomes imperfect, and it is easy to generate the problem by which the eye closure is carried out in addition to a need part.

[0010] After reading the hole array of the edge of filter base material optically, without furthermore using a mask pattern, an image processing is carried out, the nozzle which can carry out quantum impregnation of the eye sealing agent is interlocked, and the approach of pouring a direct slurry into an eye closure part separately has an expensive facility, and has the problem for which the eye closure process itself requires time amount. Anyway, especially [being large and] the filter element mentioned above had a bad yield concerning the eye closure in a dimension, and had the problem to which product cost becomes high.

[0011] The purpose of this invention cancels the technical problem mentioned above, and the gross area of the fluid channel of the upstream bordering on a filtration wall surface It can consider as the optimal cross section corresponding to the amount of solids in the fluid to filter. Moreover, since the gross area of the downstream is also made with the minimum thing corresponding to the amount and filtration application of founding liquid, the outer-diameter dimension of a filter element can also be considered as the minimum, and it is going to offer the filter element which the dimension of equipment can also do small.

[0012] Moreover, since generating of the poor coat at the time of making it double layer structure can decrease remarkably and does not use a mask pattern at all, especially other purposes of this invention Also when a fluid channel dimension is small, even if it can apply widely, there is no poor eye closure by exfoliation of a mask pattern and deformation of filter base material moreover occurs, while the eye closure is possible Eye closure time amount can be reduced and it is going to offer the manufacture approach of a filter element that a still more expensive optical image processing system and the injector of an eye sealing agent can attain the eye closure approach of unnecessary cheap cost.

[0013]

[Means for Solving the Problem] In the filter base material which the filter element of this invention becomes from an parallel fluid channel mutually [a large number divided with the porous wall] While a cross section consists of a large large diameter fluid channel and a narrow diameter fluid channel which has the magnitude of at least one cross section smaller than a large diameter fluid channel and a fluid channel carries out eye closure of one end face of a large diameter fluid channel It is characterized by the end face to which the eye closure of the large diameter fluid channel was carried out carrying out eye closure of the narrow diameter fluid channel which has the magnitude of at least one cross section by the end face of the opposite side.

[0014] With constituting a fluid channel from a large diameter fluid channel and a narrow diameter fluid channel, and constituting from a filter element of this invention so that eye closure of the large diameter fluid channel may be carried out by one end face and eye closure of the narrow diameter fluid channel may be carried out in respect of an other end The gross area of the fluid channel of the upstream bordering on a filtration wall surface can be made into the optimal cross section corresponding to the amount of solids in the fluid to filter. Moreover, since the gross area of the downstream is also made with the minimum thing corresponding to the amount and filtration application of founding liquid, the outer-diameter dimension of a filter element can also be considered as the minimum, and the dimension of equipment can also make it small.

[0015] As a suitable example of the filter element of this invention The configuration whose cross section of a fluid channel arranged the narrow diameter fluid channel in the surroundings of a large diameter fluid channel on the basis of the round shape, It sets in a vertical cross section on the shaft of the configuration whose cross section of a fluid channel arranged the narrow diameter fluid channel in the surroundings of a large diameter fluid channel on the basis of the polygon, the configuration whose polygon is a hexagon-like, and a filter element. If the configuration whose gross area of said narrow diameter fluid channel exceeded 40% of the gross area of said large diameter fluid channel, used as the inlet port of a filtration fluid the configuration and large diameter fluid channel which are 120% or less, and made said narrow diameter fluid channel the outlet of a founding fluid is taken, the effectiveness of above-mentioned this invention can be attained more suitably. <BR> [0016] Moreover, the 1st invention of the manufacture approach of the filter element of this invention A large diameter fluid channel with a consist of an parallel fluid channel mutually [ a large number divided with the porous wall ], and large fluid channel cross section, The preparation process for which the filter base material which consists of a narrow diameter fluid channel which has the magnitude of at least one cross section smaller than a large diameter fluid channel is prepared, The end side of the filter base material prepared at preparation process is immersed in an eye sealing agent. Fill up a large diameter fluid channel and a narrow diameter fluid channel with an eye sealing agent, and an eye sealing agent is alternatively filled up into a narrow diameter fluid channel with discharging an eye sealing agent from the large diameter fluid channel of filter base material. After being filled up with an eye sealing agent so that it may be again immersed in an eye sealing agent and may become longer than the restoration die length of the eye sealing agent of a narrow diameter fluid channel about the restoration die length of the eye sealing agent of a large diameter fluid channel, filter base material is cut in the location which leaves only the eye sealing agent of a large diameter fluid channel. The first eye closure process which makes only a large diameter fluid channel fill up with an eye sealing agent alternatively, The end face which carried out eye closure at the first eye closure process, and the end face of the opposite side are immersed in an eye sealing agent. After forming the restoration die length of the eye sealing agent of a narrow diameter fluid channel for a long time than the restoration die length of the eye sealing agent of a large diameter fluid channel, filter base material is cut in the location which leaves only the eye sealing agent of a narrow diameter fluid channel. the second eye closure process which makes only a narrow diameter fluid channel fill up with an eye sealing agent alternatively -- since -- it is characterized by becoming. [0017] Furthermore, the 2nd invention of the manufacture approach of the filter element of this invention A large diameter fluid channel with a consist of an parallel fluid channel mutually [ a large number divided with the porous wall ], and large fluid channel cross section, The preparation process for which the filter base material which consists of a narrow diameter fluid channel which has the magnitude of at least one cross section smaller than a large diameter fluid channel is prepared, By the end side of the filter base material prepared at preparation process being immersed in an eye sealing agent, filling up a large diameter fluid channel and a narrow diameter fluid channel with eye encapsulant, and discharging an eye sealing agent from the large diameter fluid channel of filter base material The first eye closure process which makes only a narrow diameter fluid channel fill up with an eye sealing agent alternatively, The end face which carried out eye closure at the first eye closure process, and the end face of the opposite side are immersed in an eye sealing agent. After forming the restoration die length of the eye sealing agent of a large diameter fluid channel for a long time than the restoration die length of the eye sealing agent of a narrow diameter fluid channel, filter base material is cut in the location which leaves only the eye sealing agent of a large diameter fluid channel. the second eye closure process which makes only a large diameter fluid channel fill up with an eye sealing agent alternatively -- since -- it is characterized by becoming. [0018] By the manufacture approach of the filter element of this invention, with constituting a fluid channel from a large diameter fluid channel and a narrow diameter fluid channel, the approach immersed to an eye sealing agent in the most suitable filter base material as the eye closure approach can be used, even if it does not use a mask pattern using the difference of the magnitude of the cross section of a large diameter fluid channel and a narrow diameter fluid channel. Therefore, since generating of the



poor coat at the time of making it especially double layer structure can decrease remarkably and does not use a mask pattern at all Also when a fluid channel dimension is small, even if it can apply widely, there is no poor eye closure by exfoliation of a mask pattern and deformation of filter base material moreover occurs, while the eye closure is possible Eye closure time amount can be reduced and a still more expensive optical image processing system and the injector of an eye sealing agent can attain the eye closure approach of unnecessary cheap cost.

[0019] As a suitable example of the manufacture approach of the filter element of this invention, the configuration and eye sealing agent with which filter base material consists of a ceramic ingredient consist of a ceramic ingredient. Filter base material in the state of un-calcinating The configuration and eye sealing agent which perform said first eye closure process and the second eye closure process A ceramic ingredient, In the configuration and the first eye closure process of being either of the organic system adhesives, and performing said first eye closure process and the second eye closure process after calcinating filter base material In the configuration and the second eye closure process which fill up a large diameter fluid channel and a narrow diameter fluid channel with an eye sealing agent by pulling up filter base material up after filter base material is immersed in an eye sealing agent The configuration alternatively filled up with an eye sealing agent so that the restoration die length of the eye sealing agent of a large diameter fluid channel or a narrow diameter fluid channel may become longer than the die length of the eye sealing agent of a narrow diameter fluid channel or a large diameter fluid channel by carrying out vacuum suction from the upper part of filter base material, In the second eye closure process, after filter base material is immersed in an eye sealing agent, by moving filter base material caudad in an eye sealing agent The configuration alternatively filled up with an eye sealing agent so that the restoration die length of the eye sealing agent of a large diameter fluid channel or a narrow diameter fluid channel may become longer than the die length of the eye sealing agent of a narrow diameter fluid channel or a large diameter fluid channel, If the configuration of the both ends which carried out the eye closure of a filter element in which the cover coat is applied to the whole surface at least is taken, the effectiveness of the manufacture approach of this invention mentioned above can be attained still more effectively.

[0020]

[Embodiment of the Invention] It is required to constitute from combination of the fluid channel from which at least two or more inside dimension methods differ in the direction of a cross section of the fluid channel of filter base material in this invention. The part which drawing 1 showed the end-face configuration of the filter element which consists of a fluid channel of O mold, and was smeared away black is in the condition by which the eye closure was carried out. Moreover, drawing 2 shows the end-face configuration of the filter element which consists of a fluid channel of a hexagon, and the part smeared away black similarly shows the condition that the eye closure is carried out.

[0021] When attaining the double stratification by the coat layer, since there is little exfoliation of a coat layer, there is no acute-angle section in the interior, and double stratification is easy for O mold shown in drawing 1 , and since [ which made O mold processing the subject ] it extrudes and ends with metal mold, it becomes cheap [ metal mold ]. Moreover, while an arrangement design arranges the narrow diameter fluid channel of the easy downstream moderately and can constitute minute arrangement suitably on the basis of the cross section of a large diameter fluid channel with the biggest cross section, the design of the ratio of the cross section of the upstream and the cross section of the downstream becomes easy. In the case of this example, the narrow diameter fluid channel of two kinds of dimensions is arranged to one kind of large diameter fluid channel, but, of course, the eye closure approach mentioned later is employable. Moreover, when the outer-diameter part and large diameter fluid channel of filter base material are each other interwoven with, it is desirable to make it deform suitably rather than to omit a large diameter fluid channel, and to arrange. In this case, it is necessary for the inscribed circle of the large diameter fluid channel made to deform to consider as size from the inscribed circle of a narrow diameter fluid channel.

[0022] It can do with the minimum the volume for the wall which is a filter layer, and does not have the internal acute-angle section, either, and since minute arrangement is also still easier, the hexagon-head

pass shown in drawing 2 can do the outer-diameter dimension of a filter element with the minimum, and is the most desirable. Moreover, even if the cross section of a fluid channel uses one including each deformation molds, such as a trigonum, a rectangular head, a trapezoid, an octagon, and a star type, and O mold of configurations, mixing it complexly, it is easy to be natural [ a cross section ]. The deformation mode of the large diameter fluid channel of the outer-diameter part of a filter element is the same as that of the element of the aforementioned O mold.

[0023] Moreover, since the large diameter fluid channel and the narrow diameter fluid channel are using the wall surface of a fluid channel as the filtration part, in order that that both fluid channels are close may reduce filtration resistance, they are required, and it is desirable to arrange a narrow diameter fluid channel in the surroundings of a large diameter fluid channel, and to share one narrow diameter fluid channel between two or more large diameter fluid channels. In any case, it is made into the upstream which separates the solid in a fluid and deposits a large diameter fluid channel, and, as for the downstream, it is desirable to carry out to 40 to 120% or less of the total cross section of the upstream. [ or more ] The pressure loss accompanying [ that it is less than 40% ] fluid passage of the downstream becomes large. Moreover, the gross area of the downstream is set to the usual filtration actuation. Although 100% or less is better than the gross area of the upstream in order not to enlarge the outer diameter of a filter element since what is necessary is just smallness Since increase of the pressure loss by the path of the fluid channel of the downstream becoming small occurs, and the number of paths also increases, when adopting the approach of making the downstream reduced pressure and evaporating from a filtration side and manufacture of metal mold also becomes difficult, carrying out to to 120% is desirable. It is most desirable that shortening time amount concerning the alimentation of the solid of the upstream, examination of filtration endurance, and the design of the optimal arrangement of a fluid channel and design manufacture of metal mold considers as 60 to 100% from an easy point. Although considered as the upstream of filtration of a large diameter fluid channel side in the example of this invention, when there is the need of lessening exposure area to the filtration fluid per \*\*\*\*\* part, and raising the endurance of a \*\*\*\*\* part, it is easy to be natural considering the downstream as a large diameter fluid channel.

[0024] The eye closure approach of a fluid channel is described below. According to the eye closure approach of this invention, where narrow diameter fluid channels other than a large diameter fluid channel and this large diameter fluid channel are classified, it can be used in two kinds of any mode of the approach of carrying out eye closure of the large diameter fluid channel in the first place, and the approach of carrying out eye closure of the narrow diameter fluid channels other than said large diameter fluid channel in the first place. As for filter base material and eye closure slurry liquid, it is desirable to choose the thing of a similar ingredient and a property, and after they carry out extrusion molding of what mixed methyl cellulose and polyethylene-glycol oleate with sintering assistant \*\* to which grain size becomes fused alumina of #800 from argillaceous [ , such as a feldspar and a kaolinite, ] first as a binder to the configuration shown in drawing 2 , they are calcinated at 1520 degrees C, and let them be the filter base material of a filter element. In this example, since corrosion resistance and opposite chemical nature are good, EMERENTO made from the ceramics which is the most desirable mode is explained, but if the adhesives of an organic system mentioned later are used, of course, it is applicable to the filter base material which consists of porous plastics and a sintered metal. moreover , the case of high temperature service ways , such as a filter element use for filtration of the particle in a diesel particle stripper ( DPF ) although the alumina be adopt in that a low price and reinforcement be compatible as a ceramic ingredient at this example , -- cordierite , a zirconia , a silicon nitride , etc. -- a heat temperature gradient -- size -- when a mullite and corrosion resistance be required , the ingredient according to a silicon carbide , nitriding aluminum , etc. and an application be suitably choose at the time , and it can carry out eye closure by the approach show in this invention . The outer diameter of filter base material shown in an example is  $\phi 80\text{mm}$ , and the diameter of the inscribed circle of a large diameter fluid channel set the diameter of the inscribed circle of  $\phi 3\text{mm}$  and a narrow diameter fluid channel to  $\phi 1.4\text{mm}$ . Moreover, the slurry for the eye closures (eye sealing liquid) adds the fused alumina grain of the grain size of #150 in order to make the minimum contraction at the time of the eye

closure at the fused alumina of said grain size, as adhesion material, kneads a kaolinite and orthoclase well with water, makes them the slurry of an eye sealing agent by making polyacrylic acid ammonium into sintering assistant \*\*, again, and is used at subsequent processes.

[0025] Drawing 3 (a) - (l) which shows the eye closure procedure by this invention about how to carry out eye closure of the large diameter fluid channel first explains. It is immersed in the eye sealing liquid which similarly prepared the filter base material prepared by said approach as shown in drawing 3 (a) by said approach as shown in drawing 3 (b) at die length of 4mm. Although moisture is absorbed by the base material, solid content adheres to the bore of a narrow diameter fluid channel, the eye sealing liquid which invaded into the narrow diameter fluid channel blockades this narrow diameter fluid channel, and eye sealing liquid adheres to the bore of this hole on a par with said narrow diameter fluid channel in a large diameter fluid channel side, a core takes out filter base material from eye sealing liquid, as shown in drawing 3 (c), when eye sealing liquid adheres to said narrow diameter fluid channel, since the sticking rate of eye sealing liquid is slow. In this case, filter base material is the most desirable in order that considering as the same ingredient as an eye sealing agent may make the minimum distortion by baking of the eye closure section, but in order to make fixing with filter base material good and to double a differential thermal expansion with \*\*\*\*\*, it is easy to be natural also as another ceramic ingredient. Moreover, although it is desirable to \*\*\*\*\* in the state of un-calcinating in order to lessen baking cost, temporary baking may be carried out below at the sintering temperature of filter base material, and the firmness at the time of filter base material handling may be raised. Furthermore, it is desirable that filter base material carries out eye closure by permeation of dissolution material, such as water in a slurry-like eye sealing agent, after calcinating this filter base material when it is easy to be damaged, deformation and.

[0026] As shown in drawing 3 (d) below, since a core is in a soft condition, eye sealing liquid is discharged from a large diameter fluid channel, and it is made by the aperture in a core. In order to discharge the eye sealing liquid which exists in a large diameter fluid channel more positively, it is desirable when air etc. is introduced and blown from an end face with the opposite end face which is carrying out the eye closure. Moreover, when it pulls up up, it will always move up in the state of puncturing, and the core of a large diameter fluid channel is the most desirable, as eye sealing liquid adheres to the narrow diameter fluid channel of filter base material, since the core must be puncturing the large diameter fluid channel side in this phase. Moreover, the shaft orientations of filter base material may rotate filter base material in the mode which becomes the radius approach, and may discharge the eye sealing liquid within a large diameter fluid channel according to a centrifugal force.

[0027] If eye sealing liquid is made again immersed 8mm like drawing 3 (e) after making a dryer put in and dry filter base material and making filter base material fix the eye closure section of a narrow diameter fluid channel Since the edge blockades the narrow diameter fluid channel, eye sealing liquid does not invade, but since the large diameter fluid channel is puncturing the core at least and eye sealing liquid invades into a large diameter fluid channel with the immersion to eye sealing liquid, it is immersed in eye sealing liquid until eye sealing liquid fixes in the hole of a large diameter fluid channel. Since, as for the eye closure die length of an edge, a narrow diameter fluid channel differs from a large diameter fluid channel at this time, after taking out filter base material from eye sealing liquid and drying it like drawing 3 (f), as shown in drawing 3 (g), it leaves the eye closure part of a large diameter fluid channel, and it is the location which deletes the eye closure part of a narrow diameter fluid channel, filter base material is cut, and the first eye closure process for a large diameter fluid channel is ended. This cutting has the good processing load which cutting by the diamond wheel gives to filter base material and a \*\*\*\*\* part few. As shown in drawing 3 (h) by ending the first eye closure process, eye closure of the large diameter fluid channel of filter base material can be carried out at one edge.

[0028] If it is immersed in the slurry of said eye sealing liquid at a depth of 5mm as the edge of the opposite side of the large diameter fluid channel which furthermore carried out eye closure is shown in drawing 3 (i), the eye closure will be carried out to the above by this process. In this case, in order to carry out eye closure of the narrow diameter fluid channel more positively, you may pull up up, drawing in in a vacuum from the up edge of filter base material, increasing the shaft-orientations die length of the

eye closure section of a narrow diameter fluid channel and a large diameter fluid channel by capillarity, or making eye sealing liquid adhere to a narrow diameter fluid channel side like drawing 3 (b). After taking out filter base material from eye sealing liquid and drying it in the state of drawing 3 (j), as shown in drawing 3 (k), filter base material is cut in the location where the eye closure part of a large diameter fluid channel can be deleted, and the eye closure part by the side of a narrow diameter fluid channel remains, and the second eye closure process is completed. By this second eye closure process being completed, as shown in drawing 3 (l), the filter element which carried out eye closure of the large diameter fluid channel by one end face, and carried out eye closure of the narrow diameter fluid channel in respect of the other end can be obtained.

[0029] Although the eye sealing agent was used as the same ceramic ingredient as filter base material at the above process, in the filtration filter of a water purifier for home use, the polish liquid filtration filter built in the CMP grinder in semi-conductor wafer manufacture, the filtration filter of a circulation bath, and the filtration filter water purifier of the solution in hydroponics, the temperature of a fluid is 80 degrees C or less, and the adhesives of the organic system with easy restoration as an eye sealing agent are desirable. Although the process in this case is the same as that of the eye sealing agent of a ceramic system mentioned above, the same operation effectiveness is acquired by hardening adhesives instead of adhesion of the eye sealing agent to filter base material. In this case, in order to abolish pulling filter base material and being damaged by hardening contraction of adhesives, it is desirable when the grain of the ceramic powder whose grain size is about #150, or resin is mixed in adhesives. If heat is applied in order to carry out heat hardening furthermore, since adhesives with a larger coefficient of thermal expansion than filter base material carry out tension damage of the filter base material, at the time of cooling The approach of adhesives to which adhesives are made to adhere as it consists of the base resin and the curing agent in which effectiveness is possible also in ordinary temperature, and select what has long pot life, what was diluted with solvents, such as an acetone, is used, multiple-times operation of immersion and the ejection is carried out and the internal surface of filter base material is coated is desirable.

[0030] The approach of on the other hand carrying out eye closure of the narrow diameter fluid channel in the first place is fundamentally the same as the approach of carrying out eye closure of the large diameter fluid channel mentioned above in the first place. It is immersed in the eye sealing liquid which similarly prepared the filter base material which prepared the outline by said approach as it was first shown in drawing 4 (a), when it explained by referring to drawing 4 (a) - (i) by said approach as shown in drawing 4 (b) at die length of 4mm. Next, as shown in drawing 4 (c), filter base material is taken out from eye sealing liquid. Next, as shown in drawing 4 (d), since a core is in a soft condition, eye sealing liquid is discharged from a large diameter fluid channel, and it is made by the aperture in a core. Next, filter base material is put into a dryer and filter base material is made to fix the eye closure section of a narrow diameter fluid channel. The first process can be completed in this condition, and as shown in drawing 4 (e), eye closure of the narrow diameter fluid channel of filter base material can be carried out at one edge.

[0031] Then, if filter base material is made again immersed in eye sealing liquid 8mm as shown in drawing 4 (f), since the edge blockades the narrow diameter fluid channel, eye sealing liquid cannot invade easily, but since the large diameter fluid channel is puncturing the core at least, eye sealing liquid invades into a large diameter fluid channel with the immersion to eye sealing liquid. In this case, in order to carry out eye closure of the large diameter fluid channel more positively, it is desirable to draw in in a vacuum from the up edge of filter base material, or to move filter base material caudad in eye sealing liquid. next, filter base material is cut in the location where filter base material is taken out from eye sealing liquid in, the eye closure part of a narrow diameter fluid channel can be deleted in as it is shown in drawing 5 (h), after making it dry in the condition of drawing 4 (g) being alike, and the eye closure part by the side of a large diameter fluid channel remains, and the second eye closure process \*\*\*\*\* By this second eye closure process being completed, as shown in drawing 4 (i), the filter element which carried out eye closure of the large diameter fluid channel by one end face, and carried out eye closure of the narrow diameter fluid channel in respect of the other end can be obtained.

[0032] As mentioned above, although the eye closure process of the filter element by this design has two kinds, the approach of carrying out eye closure of the large diameter fluid channel in the first place, and the approach of carrying out eye closure of the narrow diameter fluid channel in the first place. Although the approach of carrying out eye closure of the narrow diameter fluid channel in the first place at a point with few routing counters is desirable, at the point which can carry out eye closure certainly first, a large diameter fluid channel side with the large eye closure volume. The approach of carrying out eye closure of the large diameter fluid channel in the first place is desirable, and either of these two approaches can be suitably selected according to the inside dimension method of the quality of the material and the fluid channel of a ceramic base material, and the quality of the material of an eye sealing agent. Moreover, when filtering the fluid containing the solid-state which wastes filter base material, by carrying out eye closure of the eye closure section of a narrow diameter fluid channel in the first place, eye closure of the narrow diameter fluid channel in contact with the fluid containing a solid-state can be first carried out with the diameter sealing agent of the ceramics certainly, and being exposed to the fluid containing a solid-state can also carry out eye closure of few large diameter fluid channels with organic system adhesives with the easy eye closure. In this case, the point whose abrasion resistance can strengthen fixing to the filter base material of said eye closure part, and can also improve if the cover coat of textile glass yarn is applied to the filter base material end face of the narrow diameter fluid channel by which the eye closure was carried out -- it is desirable and you may carry out also to the end face of a large diameter fluid channel. Since the slurry-like eye sealing agent is used in the eye closure by this invention, when choosing a large diameter fluid channel and a narrow diameter fluid channel, it is desirable between  $\phi 1$ - $\phi 2.5$ mm inscribed circle dimensions also considering the eye sealing agent of the shape of said slurry as a cover coat of textile glass yarn.

[0033]

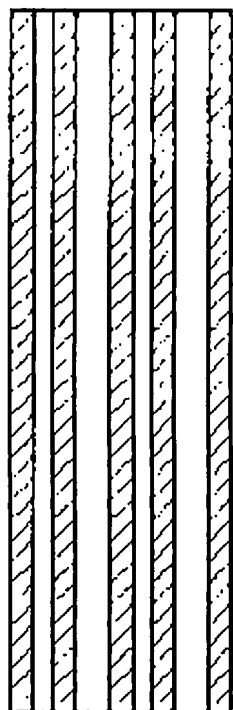
[Effect of the Invention] According to the filter element of this invention, so that clearly from the above explanation. Since a fluid channel is constituted from a large diameter fluid channel and a narrow diameter fluid channel, and it constitutes so that eye closure of the large diameter fluid channel may be carried out by one end face and eye closure of the narrow diameter fluid channel may be carried out in respect of an other end, The gross area of the fluid channel of the upstream bordering on a filtration wall surface can be made into the optimal cross section corresponding to the amount of solids in the fluid to filter. Moreover, since the gross area of the downstream is also made with the minimum thing corresponding to the amount and filtration application of founding liquid, the outer-diameter dimension of a filter element can also be considered as the minimum, and the dimension of equipment can also make it small.

[0034] Moreover, according to the manufacture approach of the filter element of this invention, since the fluid channel is constituted from a large diameter fluid channel and a narrow diameter fluid channel, the approach immersed to an eye sealing agent in the most suitable filter base material as the eye closure approach can be used even if it does not use a mask pattern using the difference of the magnitude of the cross section of a large diameter fluid channel and a narrow diameter fluid channel. Therefore, since generating of the poor coat at the time of making it especially double layer structure can decrease remarkably and does not use a mask pattern at all. Also when a fluid channel dimension is small, even if it can apply widely, there is no poor eye closure by exfoliation of a mask pattern and deformation of filter base material moreover occurs, while the eye closure is possible. Eye closure time amount can be reduced and a still more expensive optical image processing system and the injector of an eye sealing agent can attain the eye closure approach of unnecessary cheap cost.

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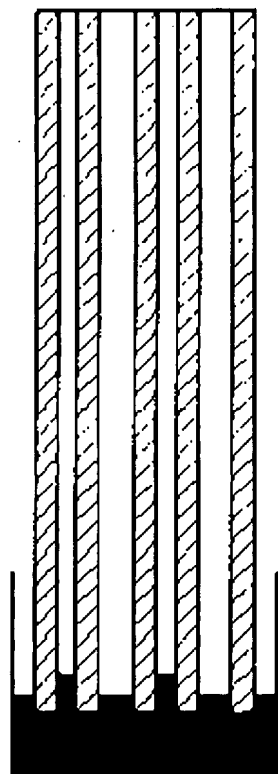
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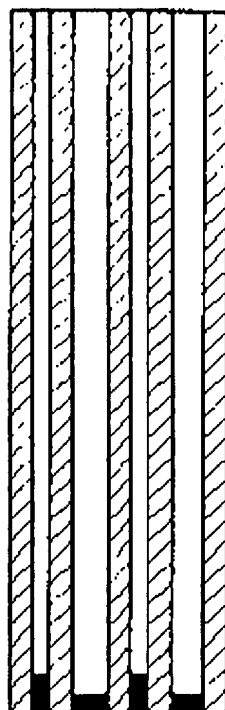
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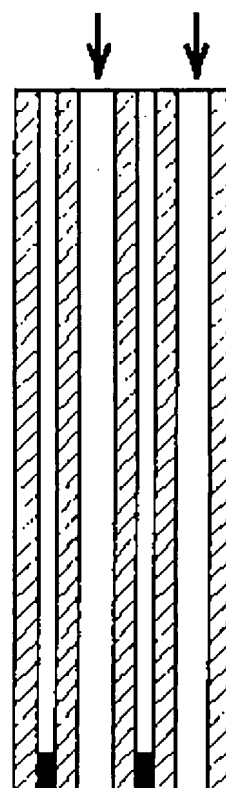
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(c)



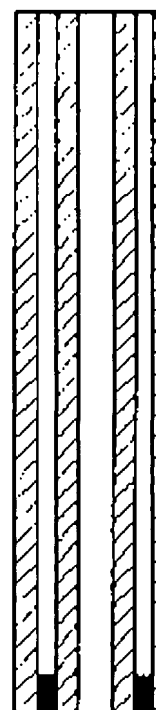
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(d)



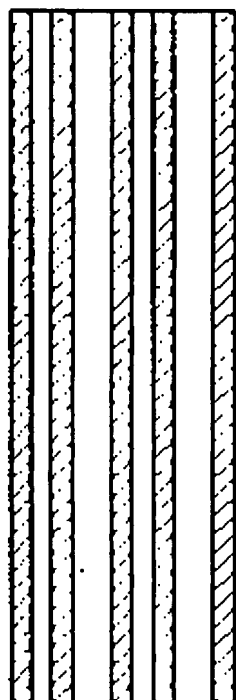
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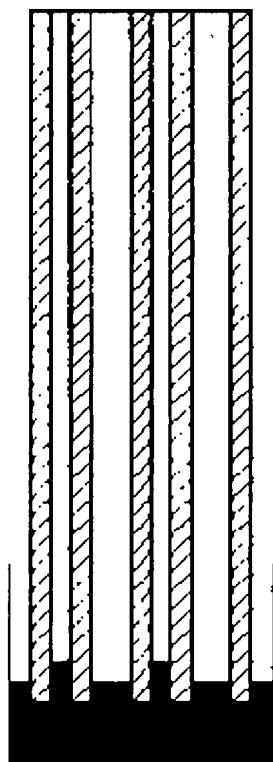
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(a)



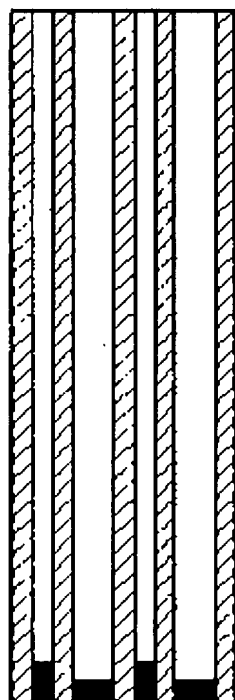
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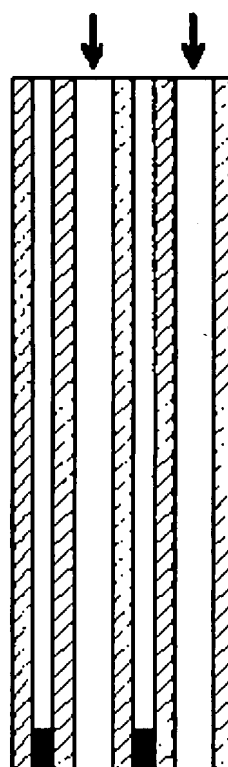
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(c)



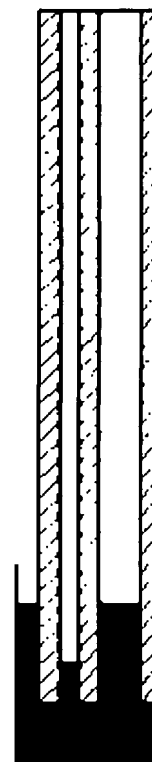
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(d)



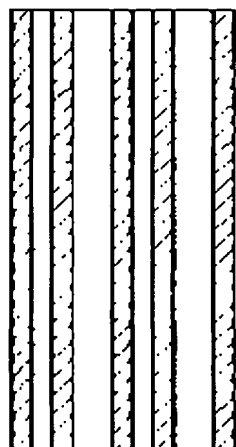
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(e)

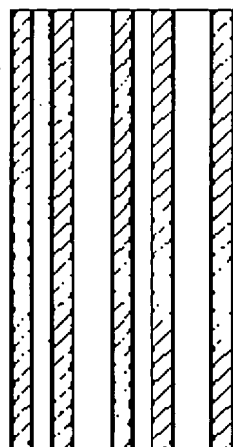


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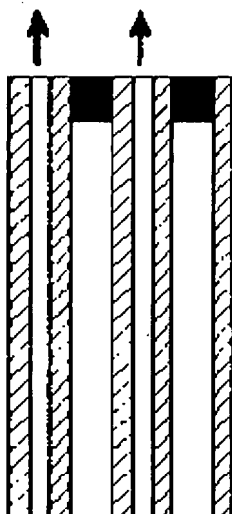
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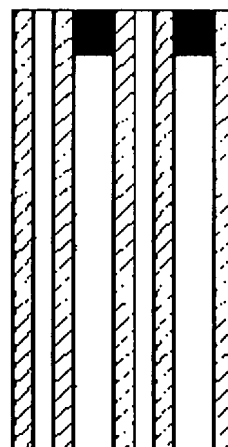
(h)



(i)



(j)



(k)

